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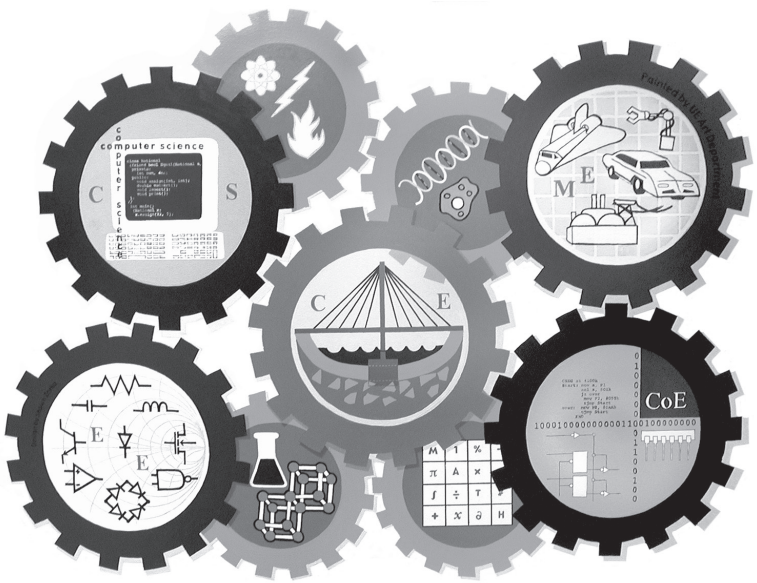

ELECTRICAL ENGINEERING
GUIDEBOOK

University of Evansville

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ELECTRICAL ENGINEERING PROGRAM GUIDEBOOK 2024-25

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Webpage

evansville.edu/electrical

ABET Computing & Engineering Accreditation Commissions

The Electrical Engineering program at the University of Evansville is accredited by the Engineering Accreditation Commission of ABET; abet.org.

Revised 2024

PROGRAM OVERVIEW AND OBJECTIVES

Electrical engineers use theory and design to manage electrical systems and devices that power our world. Technology is ever changing, shaping the way we engage with people and the environment. These evolving interactions between society and devices make the electrical engineering field dynamic, challenging, and exciting. The Electrical Engineering program at UE introduces students to this complex field while inspiring lifelong curiosity and learning.

In accordance with ABET accreditation criteria, the faculty has established program educational objectives and outcomes for students majoring in Computer Science at the University of Evansville. The purpose of these is to ensure that graduates of the program are adequately prepared to enter the workforce fully prepared as Electrical Engineers. Recognizing that performance of students and graduates is an important consideration in the evaluation of an institution, a system of ongoing assessment is conducted by faculty to continuously improve the effectiveness of the program.

Educational Objectives and Student Outcomes

Graduates are defined as Electrical Engineering alumni within three to five years of graduation.

"Students" are defined as Electrical Engineering students at the time of graduation from the University of Evansville.

Objective 1: *Graduates will be engaged in a professional career and continued or advanced study in their chosen field. This implies that graduates will recognize the value and necessity of lifelong learning.*

- **Outcome 1a.** Students will have an ability to identify, formulate, and solve complex engineering problems by applying principles of engineering, science, and mathematics. (ABET EAC outcome 1)
- **Outcome 1b.** Students will have an ability to acquire and apply new knowledge as needed, using appropriate learning strategies. (ABET EAC outcome 7)

Objective 2: *Graduates will be engaged in applications of problem-solving and communication skills for a wide variety of problems in engineering or computer science, either as individuals or in teams.*

- **Outcome 2a.** Students will have an ability to function effectively on a team whose members together provide leadership, create a collaborative and inclusive environment, establish goals, plan tasks, and meet objectives. (ABET EAC outcome 5)

- **Outcome 2b.** Students will have an ability to apply engineering design to produce solutions that meet specified needs with consideration of public health, safety, and welfare, as well as global, cultural, social, environmental, and economic factors. (ABET EAC outcome 2)
- **Outcome 2c.** Students will have an ability to communicate effectively with a range of audiences. (ABET EAC outcome 3)
- **Outcome 2d.** Students will have an ability to develop and conduct appropriate experimentation, analyze and interpret data, and use engineering judgment to draw conclusions. (ABET EAC outcome 6)

Objective 3: *Graduates will be active participants in a local, national, or global engineering or computer science community.*

- **Outcome 3a.** Students will have an ability to recognize ethical and professional responsibilities in engineering situations and make informed judgments, which must consider the impact of engineering solutions in global, economic, environmental, and societal contexts. (ABET EAC outcome 4).

In addition to strong technical skills, today's electrical engineers in the global marketplace must be adept at working with other people who have very different professional backgrounds and who may be from other countries with different cultures. The University of Evansville is helping engineers meet that challenge by providing students with a strong liberal arts background and providing an opportunity for an international experience at Harlaxton, our study abroad center in England.

The Electrical Engineering program at UE provides a firm foundation in mathematics, natural science, basic engineering analysis, and design. Students also receive much technical instruction in electric circuit analysis, C++ programming language, computer-aided simulation, and logical design of digital circuits. The program incorporates several laboratories in classes to emphasize the use of computers and basic instrumentation common to the profession.

The Electrical Engineering curriculum is typical of most EAC-ABET accredited colleges and universities. What differentiates UE's program from larger university programs is the following:

- Students have the opportunity to study abroad at Harlaxton in England and still complete their Electrical Engineering degree in eight semesters.
- Class sizes are small, allowing close personal contact between students and professors as well as design project opportunities.

- The faculty is dedicated to teaching, which gives the program great flexibility. Course content is kept up-to-date, and innovative instruction techniques, such as interdisciplinary team projects, cooperative learning, and concurrent engineering, are used in the classroom.
- Emphasis is placed on preparing students to enter the practice of electrical engineering upon graduation.
- A personalized co-op program, featuring alternating terms of paid, full-time professional employment and University attendance, is available.
- The University's size and diversity facilitates the ability of Engineering students to interact with students and faculty in other programs, thus allowing intellectual and social interchange.
- Students are mentored to develop a love of learning and discovery that will motivate them to be lifelong learners.

AREAS OF SPECIALIZATION

The Electrical Engineering program provides an introduction to nearly all areas of electrical engineering. The standard program is shown in Figure 1. In the senior year, the three Electrical Engineering electives provide the student with the opportunity to develop some depth in a particular area.

Technical electives are available in electronics, computers, electronics, power systems, and systems engineering. Students who have an interest in continuing on to graduate school may select electives in advanced mathematics or physics.

Electronics Area

An understanding of the fundamentals of electronics is central to electrical engineering. All Electrical Engineering students are required to take two courses in electronics during their junior year and one course in their senior year.

Computer Area

Students in Electrical Engineering who wish to learn more about the computer area have a wide array of courses which they may take as technical electives. These include the following courses:

Course	Title
CS 215	Fundamentals of Programming II
CS 320	Computer Architecture
CS 355	Computer Graphics
CS 430	Artificial Intelligence
CS 475	Networks

CS 215, CS 320, and CS 475 are recommended courses.

Power Systems Area

There is one required power course in the Electrical Engineering curriculum, and some power concepts are presented in EE 215. In addition, students should take ENGR 213 - Dynamics as a technical elective. ME 362 - Thermodynamics is also useful.

Systems Engineering Area

The Systems Engineering area electives at UE are concerned with either control systems or communication systems. EE 410 - Analog Circuit Synthesis and EE 465 - Digital Control Systems are particularly recommended for this area. All Electrical Engineering students take EE 360 - Linear Control Systems, and EE 470 - Communication Theory as part of their required coursework.

UNDERGRADUATE RESEARCH

There are numerous opportunities to conduct undergraduate research. All students are encouraged to participate in at least one undergraduate research project at some point during their four years at UE. Students who have an interest in graduate school are strongly encouraged to participate in multiple programs. Some of the undergraduate research opportunities available to students studying Electrical, Computer Engineering, or Computer Science are described below.

NSF Sponsored Research Experience for Undergraduates (REU)

This program is sponsored by the National Science Foundation. It allows undergraduates to participate in research projects at major research institutions across the country. Participating students typically have a B+ or better grade point average and have achieved junior status. Most REUs provide a stipend (about $2,000 to $3,000 for 10 weeks) and some provide a housing or moving allowance. All REUs take place during the summer. For more information visit the website at nsf.gov/crssprgm/reu/index.jsp.

UE Sponsored Undergraduate Research

The University of Evansville also sponsors summer research projects which typically provide a housing allowance or a stipend (about $2,000). Almost all academic areas participate in these projects which are awarded to students on a competitive basis. All projects result in a student publication or presentation at a national or regional conference.

Special Topics and Independent Study

Many professors are willing to sponsor research projects during the school year. Students typically register for Electrical Engineering 498 or Computer Science 498 and receive one to three hours of credit for such study.

National Competition Projects

Electrical Engineering students participate in several regional and national competitions, and all students (including freshmen) are eligible to participate in these projects. The southeast region of the Institute of Electrical and Electronics Engineers sponsors a robot competition each year. This is a team project and is usually completed as part of the senior design. Trinity University in Connecticut sponsors a national firefighting robot competition in which a robot must find its way through a maze, locate a candle, and extinguish it.

CO-OP AND INTERN PROGRAMS

Electrical Engineering majors are encouraged to participate in cooperative education (co-op program) or internships during their time at UE. These programs offer students the opportunity to gain industrial experience working as an electrical engineer while completing their BSEE degree.

Internships are available to students who would like to gain engineering work experience without a long-term commitment. Internships are available as full-time jobs during the summer or as part-time jobs during the school year.

The typical Electrical Engineering co-op student goes to school the first two years just as a non-co-op student does. At the end of theier sophomore year, the co-op student goes to work and works through the summer. The student is back in school in the fall and out to work in the spring. Thereafter, the student alternates between work and school.

CO-OP CALENDAR			
Year	**Fall**	**Spring**	**Summer**
1	School 1	School 2	Work option
2	School 3	School 4	Work 1
3	School 5	Work 2	School/Work option
4	Work 3	School 6	Work 4
5	School 7	School 8	

Some students who are exceptionally well-prepared to enter the work force may begin their co-op period in the summer after the freshman year. This is unusual, and most students begin after the sophomore year. The summer after the junior year may be either school or work as needed.

To enter the co-op program, students should enroll in Experiential Education 90. This is a noncredit course which should be taken during the fall of the sophomore year. This course covers such topics as résumé writing, interviewing, and what is expected on the job. During the spring of the sophomore year, the typical co-op student interviews with prospective employers. The career placement office takes care of contacting employers and arranging interviews for students. Placement in a co-op or intern position is dependent on the outcome of the interview process.

Co-op and internship students in Electrical Engineering have a wide range of employers to choose from. Employers are located in the immediate Evansville area, in the surrounding region of Indiana, Kentucky, and Illinois, and in various places throughout the country.

The companies listed below are some of the companies that have provided Electrical Engineering students with co-op or intern opportunities in the past.

Alcoa
Boeing
General Electric
Intel Corporation
NWSC Crane
Toyota
Vectren Energy Delivery
Whirlpool Corporation
Wright-Patterson AFB

The real value of the co-op and intern programs is in the experience that it provides the student. A co-op job can be a financial benefit, but one term at work does not typically cover the cost of one term of education. The co-op and intern programs give employers a chance to look at a student as a prospective employee without making a commitment to long-term employment. Likewise, these programs give the student a chance to look at a company and gain some experience before entering the work force as a working professional.

Students who participate in the co-op and intern programs normally get a higher salary offer upon graduation than do non-co-op students. In many cases the co-op employer provides a long-term employment opportunity for the co-op student upon graduation.

HARLAXTON OPTION

Harlaxton is the study abroad center of UE and is located in the rolling countryside of Grantham, England. Harlaxton is about a one-hour ride by train from London. Engineering students who choose to spend a semester studying at Harlaxton have easy access to England's culture, history, and entertainment.

Harlaxton is housed in a large Victorian manor where about 200 students and faculty live and hold classes. The Manor has a number of historic state rooms, a soccer field, sports hall, student lounges, bistro and walking trails.

Engineering students who wish to study one semester in England are encouraged to do so during the first semester of their sophomore year. At Harlaxton, Engineering students typically take Calculus, British studies, and general education classes. Harlaxton is on the semester system and all classes earn credit at the University in the same way they would if they were taken in Evansville. Since the Engineering program requires a number of general education classes, all classes taken at Harlaxton count as required courses toward the Engineering degree. Tuition at Harlaxton is the same as tuition at the Evansville campus, and all scholarships and loans may be applied to Harlaxton costs.

Students at Harlaxton are encouraged to travel on weekends. The manor arranges eight to 10 weekend field trips to locations such as Nottingham, London, Scotland, and Wales. During some semesters, less frequent but longer trips are arranged to Ireland and the continent.

Harlaxton has its own resident British faculty as well as visiting faculty from the home campus and other selected universities in the United States. Likewise, students at Harlaxton come from the Evansville campus, England, and various other campuses around the United States.

Harlaxton Costs

While the tuition at Harlaxton is the same as on the Evansville campus and all scholarships apply to Harlaxton, there are additional costs associated with travel. The typical airplane round trip is $1,500 and the typical student at Harlaxton will spend an additional $3,000-$4,000 on weekend trips, souvenirs, and other miscellaneous expenses.

HONORS PROGRAM

The Honors Program is open to select students. Typically students apply when admitted to the University, but also may apply during the first year of study. Admittance to the Honors Program is determined by the University Honors Committee on the basis of standardized test scores, high school grade point average, extracurricular activities, and an essay. The Honors Program provides participants with the opportunity to interact with other Honors Program students, both socially and academically. Special honors courses and other academic events are available for honors students. Honors students are able to register early, live in the honors residence hall, and receive a University Honors designation on official transcript.

To successfully complete the Honors Program, a student must fulfill the following requirements.

- Achieve a GPA of 3.5 or above by the time of graduation
- Complete 15 credit hours of honors courses
- Complete an honors project
- Earn four honors participation points per semester

Honors courses are designated as such by the Registrar. In addition, a limited number of courses may be contracted formally as honors courses, generally requiring additional or alternative coursework. A sufficiently complex Computer Science senior project can be approved as an honors project. Often these projects are more research-oriented than the typical senior project.

Honors participation points are earned by attending Honors Program activities. Each semester a major event is held that is worth three honors participation points. Currently the fall event is a formal banquet and the spring event is a Nerd Wars Trivia night. In addition, six to eight smaller events are organized that are worth one honors participation point each. These events include group attendance at athletic events, theatre and music performances, other academic or social events, and Honors Project presentations. Students studying at Harlaxton or other study abroad programs are granted the four honors participation points for that semester automatically in recognition of the study abroad experience.

Honors Activities (points vary)
Students may receive Honors Program points for activities other than traditional coursework. These might include a summer research experience for undergraduates (REU) program, an internal research project, a paper or poster presentation, a summer internship, completion of the co-op program, participation in an IEEE or ACM sponsored contest, participation in community projects, or a leadership role in a student professional organization.

Bachelor of Science in Electrical Engineering

FALL			SPRING		
		FRESHMAN			
CHEM 118	Principles of Chemistry	4	CS 210	Fundamentals of Programing I	3
EE 101	Introduction to Electrical Computer Engineering	3	MATH 222	Calculus II	4
FYS 112	First-Year Seminar	3	PHYS 210	Calculus Physics I	4
MATH 221	Calculus I	4		General Education	3
	Foreign Language 111*	3		Foreign Language 112*	3
		17			17
		SOPHOMORE			
EE 210	Circuits	3	EE 215	Circuits II	3
ME 212	Statics	3	EE 254	Logic Design	3
MATH 323	Calculus III	4	EE 342	Electronics I	3
PHYS 211	Calculus Physics II	4	ENGR 390	Enginering Mathematics	3
	General Education	3	MATH 324	Differential Equations	3
		17			15
		JUNIOR			
EE 310	Signals and Systems	3	EE 311	Digital Signal Processing	3
EE 330	Introduction to Power Systems	3	EE 360	Control Systems	3
			EE 380	Instrumentation Lab	3
EE 343	Electronics II	3	EE 454	Microcontroller Applications	3
EE 354	Embedded Systems	3			
	General Education	3	EE 494	Senior Project Seminar	0
		15		General Education	3
					15
		SENIOR			
EE 420	Electromagnetics	3	EE 497	Senior Project Phase II	3
EE 445	Industrial Electronics & Systems	3		Electrical Engineering Elective	3
EE 495	Senior Project Phase 1	3		Math/Science Elective	3
	Electrical Engineering Elective	3		General Education	3
	General Education	3		Free Elective	3
	Health and Wellness	1			15
		16			

*Note: Only if necessary to meet the University foreign language requirement.

Harlaxton Option Plan of Study
Bachelor of Science in Electrical Engineering

FALL			SPRING		
FRESHMAN					
CHEM 118	Principles of Chemistry	4	CS 210	Fundamentals of Programming I	3
EE 101	Introduction to Engineering	3	EE 210	Circuits	3
FYS 112	First-Year Seminar	3	MATH 222	Calculus II	4
MATH 221	Calculus I	4	PHYS 210	Calculus Physics I	4
	Foreign Language 111*	3		Foreign Language 112*	3
		17			17
SOPHOMORE					
ID H282/H283	The British Experience	6	EE 215	Circuits II	3
MATH 324	Differential Equations	3	EE 254	Logic Design	3
	General Education	3	EE 342	Electronics I	3
	General Education	3	ENGR 390	Engineering Mathematics	3
		15	MATH 323	Calculus III	4
					16
JUNIOR					
EE 310	Signals and Systems	3	EE 311	Digital Signal Processing	3
EE 343	Electronics II	3			
EE 354	Embedded Systems	3	EE 360	Control Systems	3
EE 331	Energy Conversion Systems	3	EE 380	Instrumentation Lab	3
			EE 454	Microcontroller Applications	3
	General Education	3			
		15	EE 494	Senior Project Seminar	0
				General Education	3
					15
SENIOR					
EE 420	Electromagnetics	3	EE 497	Senior Project Phase II	3
EE 470	Communication Theory	3	ME 212	Statics	3
EE 495	Senior Project Phase 1	3		Electrical Engineering Elective	3
PHYS 211	Calculus Physics II	4			
	Eelectrical Engineering Elective	3		Math/Science Elective	3
				Free Elective	3
		16		Health and Wellness	1
					16

*Note: Only if necessary to meet the University foreign language requirement.

Engineering Management Minor

A minor in Engineering Management is offered by the School of Engineering and Computer Science in cooperation with the Schroeder School of Business. For Electrical and Computer Engineering students, the Engineering Management minor can be earned by taking the following courses.

Engineering Management Minor *(18 hours)*

ECON 101	Principles of Macroeconomics (general education outcome 9)
or	
ECON 102	Principles of Microeconomics
ENGR 390	Applied Engineering Mathematics (required)
ENGR 409	Engineering Economy and Decision Making
COMM 380*	Intercultural Communication (general education outcome 9 and overlay A)
or	
BUS 100	Introduction to Business
MGT 331	International Business Strategy
or	
MGT 377	Organizational Behavior
LSCM 315	Introduction to Logistics and Supply Chain Management

All Electrical Engineering students pursuing this minor should see an advisor to carefully choose courses which also meet general education requirements. With careful curriculum planning, Electrical Engineering students can earn an Engineering Management minor by taking just three additional courses.

Mathematics Minor

To obtain a minor in Mathematics from the College of Arts and Sciences, students must take MATH 221, MATH 222, and four Mathematics courses numbered 300 or above (including ENGR 390 and PHYS 305). Students who satisfy the Electrical Engineering degree requirements only need to take one additional Mathematics course numbered 300 or above to satisfy the Mathematics minor requirements. By taking either PHYS 305 or a 300- level or higher Mathematics course to satisfy the math/science elective, Electrical Engineers can satisfy the Mathematics minor requirement without taking any additional courses.

Computer Science Minor

A minor in Computer Science is offered by the School of Engineering and Computer Science. Electrical and Computer Engineering students can earn a Computer Science minor by taking the following courses.

Computer Science Minor

ENGR 123	Programming for Engineers
or	
CS210	Fundamentals of Programming I
CS220	Logic Design and Machine Organization
or	
EE 254	Logic Design
CS 215	Fundamentals of Programming II
CS 290	Object Oriented Design

Plus 9 hours of 300 or 400 level CS courses

Course	Title
EE 410	Analog Circuit Synthesis
EE 440	Communication Electronics
EE 465	Digital Control Systems
MATH 341	Linear Algebra

Biomedical Option

Electrical Engineering majors may receive a bachelor's degree in Electrical Engineering with a Biomedical option by substituting Biology 107, 112, 113, and a 3-credit Biology elective for Electrical Engineering 430, 471, and Physics 213/214. Two of the Electrical Engineering technical electives may be chosen in the Electrical Engineering area or in the Biology area with guidance and permission from the academic advisor. In addition, the senior project must be Biomedical-related.

Graduate School

Electrical Engineering students who intend to go to graduate school for more specialization should take courses in advanced mathematics or in areas that provide a broad theoretical foundation in particular areas. The following courses may be useful for this purpose.

Course	Title
EE 410	Analog Circuit Synthesis
EE 415	Image Processing
EE 465	Digital Control Systems
MATH 365	Probability
MATH 420	Advanced Calculus
PHYS 305	Mathematical Physics
PHYS 471	Quantum Mechanics

ELECTRICAL ENGINEERING COURSES

For course descriptions, visit evansville.edu/electrical and select Course Offerings under the About Our Program menu.

EE 210 Circuits

EE 215 Circuits and Systems

EE 254 Logic Design

EE 310 Signals and Systems

EE 311 Digital Signal Processing

EE 330 Introduction to Power Systems

EE 331 Energy Conversion Systems

EE 342 Electronics I

EE 343 Electronics II

EE 354 Embedded Systems

EE 360 Control Systems

EE 380 Instrumentation Lab

EE 420 Electromagnetics

EE 445 Industrial Electronics and Controls

EE 454 Microcontroller Applications

EE 494 Senior Project Seminar

EE 495 Senior Project Phase 1

EE 497 Senior Project Phase 2

EE 499 Special Topics in Electrical Engineering

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